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Claims

[c1] A planar photonic bandgap structure suitable for use as an optical element providing a waveguiding function, the structure comprising:
a substrate;
a membrane having a plurality of holes therein arranged so as to define the waveguiding function provided by the optical element,
said membrane being suspended above the substrate by a supporting film between the substrate and the membrane around a peripheral region of the membrane; and
a waveguiding film applied directly on and registered with the membrane so as to avoid the plurality of holes, wherein the waveguiding film has an index of refraction which is higher than an index of refraction of the membrane to allow the waveguiding function to occur in the waveguiding film.

[c2] The planar photonic bandgap structure of claim 1, wherein the membrane comprises PMMA.

[c3] The planar photonic bandgap structure of claim 1, wherein the supporting film comprises MMA/MAA.

[c4] The planar photonic bandgap structure of claim 1, wherein the waveguiding film comprises silicon.

[c5] A method of forming a continuously suspended membrane, the method comprising:
providing a substrate;
applying a first film on the substrate;
applying a second film on the first film;
exposing a pattern including a plurality of holes on the second film;
developing the exposed pattern using a solvent,
wherein a dissolution rate of the first film in the solvent is greater than a dissolution rate of the second film in the solvent,
wherein a development time of the exposed pattern is selected to form a continuously suspended membrane from undissolved portions of the second film,
said continuously suspended membrane being separated from the substrate by a void area.

[c6] A method of forming a planar photonic bandgap structure comprising applying a waveguiding layer onto a top surface of the continuously suspended membrane of claim 5, said waveguiding layer having an index of refraction greater than an index of refraction of the continuously suspended membrane, wherein the plurality of holes are free of any of the waveguiding layer.

[c7] The method of claim 6, wherein said applying a first film includes applying a copolymer film.

[c8] The method of claim 6, wherein said applying a first film includes applying an MMA/MAA film.

[c9] The method of claim 6, wherein said applying a second film includes applying PMAA.

[c10] The method of claim 6, wherein said exposing a pattern includes exposing the pattern by a lithographic technique.

[c11] The method of claim 6, wherein said exposing a pattern includes exposing the pattern by e-beam lithography.

[c12] The method of claim 6, wherein said applying a waveguiding layer includes applying a layer of a semiconductor material.

[c13] The method of claim 6, wherein said applying a waveguiding layer includes applying a layer of silicon.

[c14] The method of claim 6, wherein said developing the exposed pattern includes removing essentially all of the first film between the substrate and the second film except around a supported peripheral area of the continuously suspended membrane.

[c15] The method of claim 6, further comprising defining a waveguiding function of the planar photonic bandgap structure by arranging the plurality of holes in the exposed pattern.

[c16] A planar photonic bandgap structure produced by the method of any one of claims 5-15.